APPENDIX C: Bridge Construction and Review Primer

Riverways Programs
Department of Fisheries, Wildlife
& Environmental Law Enforcement

Between aging infrastructure and new development, bridge construction and reconstruction is fairly common. The special nature of bridge construction raises the potential for environmental impacts. This primer highlights the special nature of bridge construction, and ways to minimize environmental impacts from nonpoint source pollution. It is intended as a partial guide for designing or reviewing bridge construction work.

Never Forget the Basics

- ⇒ Schedule work for the DRY SEASON.
- ⇒ Limit the area of disturbed land.
- ⇒ Limit the time soil is left exposed.
- ⇒ Maintain Best Management Practices. (BMPs)
- ⇒ Do not allow equipment maintenance in areas draining directly to the stream.

Special Considerations During Construction

Bridge construction and reconstruction is similar to any land disturbing activity. Basic environmental practices are crucial. In addition, the very nature of bridge construction and reconstruction creates unique hazards for nonpoint source pollution. Bridge construction takes place directly adjacent to and above vulnerable water resources. This leads to special and interrelated challenges.

- ⇒ Potentially large quantities of water entering the site down the river, and down the road.
- ⇒ A very limited amount of space for BMPs.
- ⇒ Steep embankment ending at valued resources.

Flooding

The erosion control plan should address a specific design flood. Calculating a flood height is not an exact science. For this and other reasons a conservative (infrequent & high) design flood is called for. The 50 year flood is a common standard where work will continue through the wet season.

The proximity of bridge construction to stream, wetlands and flood plains make it necessary to place the traditional border of sediment fences and hay bales in the flood plain. Sediment fences must be tall enough and sturdy enough to function throughout the design flood and hay bales secured from floating away. The road surface leading to the bridge may be a significant source of runoff. There is the potential for large amounts of water to enter the construction site down that path. This makes it likely that these sediment control devices will have to filter unusually large quantities of water and sediment.

- ⇒ What areas on the site plan will be covered by the design flood?
- ⇒ How will BMPs in the flood plain be affected by flooding?
- ⇒ Who will inspect and maintain sediment controls before, during and after storms?

Dry Work Zones

If work is to be done on bridge footings, a dry work zone under the river level is required. Dry work zones mean keeping the water away and pumping the work zone dry. Keeping the stream out of the work zone requires either a temporary dam around the work zone, squeezing the stream through the remaining space, or diverting the water to an entirely new channel. In either case the room for the river to flow will be reduced. This restriction may compound flooding problems just upstream of the bridge. In other words, what might have been a minor flood before, may be a major flood during construction. The effect is localized, right where BMPs must be installed. This is another reason to design with a conservative flood in mind.

A second complication of dry work zones is the disposition of the water pumped out of the work zone. Initially this water is laden with sediment and should be pumped to a treatment area, like a settling pond, rather than directly back into the stream.

⇒ Will a dry work zone be built? How?
⇒ Where will water be pumped to?
⇒ How were BMPs for pumped water sized?

Steep Embankments

Bridge construction sites will almost certainly have steep embankments. In addition, large quantities of water may run down the road to the construction site arriving at the top of these slopes creating the potential for severe erosion. Sound erosion control involves controlling the path and entry of the runoff, and minimizing the exposure of soil to erosive forces. Special care must be taken to convey storm runoff down the vertical drop represented by the embankment. If storm sewers are already installed they are the likely path. Temporary pipes, and armored channels are other possibilities. The worst case would be for road runoff to collect and pour down an unprotected dirt embankment directly into the stream. Runoff will acquire kinetic energy descending the vertical drop representing the embankment. That energy must be dissipated both during construction and afterwards. Embankments, and any disturbed earth, including fill, should be stabilized as soon as possible.

Project plans are required to state drainage conditions before and after construction. In the case of bridges, it is prudent to plan carefully and review the drainage patterns during construction.

⇒ Where and how will water descend from road level to river level?
⇒ When and how will slopes be stabilized?

Work Directly Over Water

Some work, such a painting, involves the use of potentially hazardous materials directly over the water. For such work provisions should be made to intercept typical splatter and possible accidents. In no case should large quantities of paint, fuel or other chemicals be stored or transferred from one container to another where a spill will travel directly, or through the nearest storm drain, into the river.

⇒ Will any sort of draping be used?

Post Construction Infrastructure

Road Runoff

Road runoff is a major source of nonpoint source contaminants throughout the Commonwealth. Because bridges last so long, their construction or reconstruction is a rare opportunity to improve the treatment of road runoff which will have a lasting effect. The methods for limiting the impacts of nonpoint source pollution have become known as Best Management Practices (BMPs). The most appropriate combination for any given site must be determined on a case by case basis considering the site itself, the amount of traffic and runoff as well as the nature of the receiving water. Generally, once the water is off the road surface the longer the time it takes to get to the stream the better. That amount time is the only time available to clean up chemical spills resulting from accidents. Longer times imply slower water speeds and the chance for sediment to settle out. Extended contact with a rich biotic community, like a constructed wetland, allows plants to adsorb nutrients, and organisms to metabolize toxics.

⇒ What BMPs will be used to treat road runoff before it enters the stream?
⇒ Consult the DEP Nonpoint Source Mega-Manual

Other Environmental Effects

Alterations in the stream bottom may form a barrier to fish and other wildlife if the stream is run through a long smooth culvert forming a long, fast, uninterrupted current. Providing eddies in the current is simple and allows upstream fish migration. On the other hand, a box culvert may spread low flows into an impassable shallow sheet. Contact your regional DPW office for advide.

Bridges may be both a hazard and access point for canoeists and anglers. Will a canoe and passengers fit under the bridge? If not, is a portage path appropriate? Is it possible and appropriate to provide safe parking and access?

Bridges Last A Lifetime

Think Long Term